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FREQUENCY, FUNCTION & WAVEFORM SYNTHESIZERS

1 μHz to 21 MHz Synthesizer/Function Generator

Model 3325A

- Synthesizer
- Function generator
- Sweeper
- Programmable

HP 3325A

DESIGNED FOR HP-IB SYSTEMS

Description

The HP 3325A Synthesizer/Function Generator is an uncompromising, high performance synthesizer with 11 digit resolution, a function generator with precision waveforms, a wideband sweeper, and a fully programmable systems instrument.

Synthesizer

The HP 3325A is first with microhertz resolution below 100 kHz along with frequency coverage from .000001 Hz to 20.999 999 999 MHz. Signal purity, accuracy and stability are as good or better than earlier stand-alone HP synthesizers. Harmonics are 65 dB down below 50 kHz and you can externally modulate with AM and PM.

Function Generator

The HP 3325A is also a high performance function generator providing precision waveforms with synthesizer accuracy and resolution. Squarewaves to 10.999 999 999 MHz have 20 ns rise and fall times. Triangles and ramps with .05% linearity are available up to 10.999 999 999 kHz. All waveforms can be dc and phase offset.

A Wideband Sweeper

A major contribution is wideband phase continuous sweep, covering up to the full frequency range of each waveform. Sweep log or linear, single or continuous without the phase discontinuities usually associated with synthesizers. Phase lock loop testing is made easier.

Make convenient swept frequency network measurement on filters, amplifiers or any passive or active network. Use the TTL marker to check the frequency of points of interest on a swept frequency display desired. Use the convenient "zoom" functions ΔF×2 and ΔF÷2 to quickly change the frequency span for the display desired.

Fully Programmable

All necessary functions are programmable on the HP-IB, including frequency, amplitude, all functions, phase and dc offset, modulation, all sweep parameters, amplitude cal and self-test, making the HP 3325A a very versatile and powerful addition to automatic test systems. The isolated interface combined with floating outputs and inputs and talk mode make the HP 3325A easy to use in Automatic Test Systems.

More Features

The phase of the output can be changed ±719.9° with 0.1° resolution. The phase is advanced (or retarded) with respect to the starting phase. Two HP 3325A units can be phase locked together for dual phase output applications.

DC offset is capable of ±4.5 Vdc on the standard instrument. The high voltage option (Opt 002) allows ac voltages up to 40 Vpp and ac + dc up to ±18 V total (ac peak + dc).

Ten storage registers can be programmed with ten different combinations of function/parameter settings from the front panel, stored and then recalled.

The HP 3325A can display 11 digits of frequency and 4 digits of volts or millivolts from 1 mV to 10 volts peak to peak. Conversion to RMS or dBm is simple with the touch of a button.

New Technology

The HP 3325A provides unprecedented performance per dollar thanks to several major contributions from advances in HP technology. A single loop Fractional-N synthesis technique allows synthesizer accuracy with 11 digits of resolution and, as an added bonus, phase continuous frequency sweep. Fewer parts and integrated circuit technology make the difference. A unique method of triangle and ramp waveform generation provides excellent linearity. Add microprocessor control and Hewlett-Packard Interface Bus (HP-IB) operation and the result is more performance, flexibility and versatility on the bench or in automatic test systems than previously available, and at a lower cost.

Specifications

Refer to the HP 3325A data sheet for complete specifications.

Waveforms

Sine, Square, Triangle, negative and positive Ramps.

Frequency

Range

Sine: 1 μHz to 20.999 999 999 MHz
Square: 1 μHz to 10.999 999 999 MHz
Triangle/ramps: 1 μHz to 10.999 999 999 kHz

Resolution: 1 μHz, < 100 kHz
1 mHz ≥ 100 kHz

Aging rate: $\pm 5 \times 10^{-6}$/year, 20° to 30°C

Warm-up time: 20 minutes to within specified accuracy

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Main Signal Output (all waveforms)

Impedance: 50 Ω
Connector: BNC; switchable to front or rear panel, nonswitchable with option 002, except by internal cable change.

Amplitude

Range: 1 mV to 10 V p-p in 8 amplitude ranges, 1-3-10 sequence (10 dB steps), into 50 Ω load.

Function	Sine		Square		Triangle/Ramps	
Units Displayed	min	max	min	max	min	max
peak-peak	1.000 mV	10.00 V	1.000 mV	10.00 V	1.000 mV	10.00 V
rms	0.354 mV	3.536 V	0.500 mV	5.000 V	0.289 mV	2.887 V
dBm (50 Ω)	−56.02	+23.98	−53.01	+26.99	−57.78	+22.22

Resolution: 0.03% of full range or 0.01 dB (4 digits).

Amplitude Accuracy (without dc offset, relative to programmed amplitude and accuracy)

Sinewave Amplitude Accuracy
1 mHz to 100 kHz: ±0.1 dB, ≥3 Vpp; ±0.2 dB, <3 Vpp
100 kHz to 20 MHz: ±0.4 dB, ≥3 Vpp; ±0.6 dB, 0.1 to 3 Vpp
Squarewave Amplitude Accuracy
1 mHz to 100 kHz: 1%, ≥3 Vpp; 2.2%, <3 Vpp
100 kHz to 10 MHz: 11.1%, ≥3 Vpp; 13.6%, <3 Vpp
Triangle Amplitude Accuracy
1 mHz to 2 kHz: 1.5%, ≥3 Vpp; 2.7%, <3 Vpp
2 kHz to 10 kHz: 5%, ≥3 Vpp; 6.2%, <3 Vpp

Sinewave Spectral Purity

Phase noise: −60 dB for a 30 kHz band centered on a 20 MHz carrier (excluding ±1 Hz about the carrier) with high-stability option 001 installed.
Spurious: all non-harmonically related output signals will be more than 70 dB below the carrier (60 dB with dc offset), or less than −90 dBm, whichever is greater.
Sinewave harmonic distortion: harmonically related signals will be less than the following levels (relative to the fundamental) at full output for each range:

Frequency Range	Harmonic Level
0.1 Hz to 50 kHz	−65 dB
50 kHz to 200 kHz	−60 dB
200 kHz to 2 MHz	−40 dB
2 MHz to 15 MHz	−30 dB
15 MHz to 20 MHz	−25 dB

Squarewave Characteristics

Rise/fall time: ≤20 ns, 10% to 90% at full output
Overshoot: ≤5% of peak to peak amplitude, at full output
Settling time: <1 μs to settle to within .05% of final value.

Phase Offset

Range: ±719.9° with respect to arbitrary starting phase or assigned zero phase
Resolution: 0.1°
Accuracy: ±0.2°

DC Offset

Range: dc only (no ac signal): 0 to ±5.0 V/50 Ω.
dc + ac: Maximum dc offset ±4.5 V on highest range, decreasing to ±4.5 mV on lowest range.
Resolution: 4 digits

Sinewave Amplitude Modulation

Modulation depth at full output for each range: 0–100%
Modulation frequency range: dc to 400 kHz (0–21.MHz carrier frequency)
Sensitivity: ±5 V peak for 100% modulation

Sinewave Phase Modulation

Range: ±850°, ±5 V input
Modulation frequency range: dc −5 kHz

Frequency Sweep

Sweep Time
Linear: 0.01 s to 99.99 s
Logarithmic: 2 s to 99.99 s single, 0.1 s to 99.99 s continuous
Maximum sweep width: full frequency range of the main signal output for the waveform in use, except minimum log start frequency is 1 Hz.
Phase continuity: sweep is phase continuous over the full frequency range of the main output.

Auxiliary Inputs and Outputs

Reference input: for phase-locking HP 3325A to an external frequency reference signal from 0 dBm to +20 dBm into 50 Ω. Reference signal must be a subharmonic of 10 MHz from 1 MHz to 10 MHz.
Auxiliary frequency output: 21 MHz to 60.999 999 999 MHz, under range coverage to 19.000 000 001 MHz, frequency selection from front panel; 0 dBm; output impedance 50 Ω.
Sync output: square wave with V (high) ≥1.2 V, V (low) ≤ 0.2 V into 50 Ω.
X-Axis drive: 0 to >+10 V dc linear ramp proportional to sweep frequency, linearity, 10–90%, ± 0.1% of final value.
Sweep marker output: high to low TTL compatible voltage transition at selected marker frequency.
Z-Axis blank output: TTL compatible voltage levels capable of sinking 200 mA from a positive source.
1 MHz reference output: 0 dBm output for phase-locking additional instruments to the HP 3325A.
10 MHz oven output: 0 dBm internal high stability frequency reference output for phase-locking HP 3325A. (Opt. 001 only)

HP-IB Interface Functions: SH1, AH1, T6, L3, SR1, RL1, PP0, DC1, DT0, C0, E1.
Recommended Accessory: HP 7090A Measurement Plotting System.

Option 001 High Stability Frequency Reference

Aging rate: ± 5 × 10^{-8}/week (72-h warm up); ±1 x 10^{-7}/month (after 15 days continuous operation).
Ambient stability: ±5 × 10^{-8} (0° to +55°C).
Warm-up time: reference will be within ±1 × 10^{-7} of final value 15 minutes after turn-on for an off time of less than 24 hours.

Option 002 High Voltage Output

Frequency range: 1 μHz to 1 MHz

Amplitude

Range: 4.00 mVpp to 40.00 Vpp (500 Ω, < 500 pF load).
Accuracy and Flatness at Full Output
Sine, square, and triangle waves: ±2% at 2 kHz
Ramps: ±2% at 500 Hz
Flatness: ±10% relative to programmed amplitude
Sinewave distortion: harmonically related signals will be the same as the standard instrument to 1 MHz
Maximum output current: 80 mApp.
Output impedance: < 2 Ω at dc, < 10 Ω at 1 MHz

DC offset range: 4 times the specified range of the standard instrument.

General

Operating environment
Temperature: 0°C to 55°C.
Relative humidity: 95%, 0°C to 40°C.
Altitude: ≤ 15,000 ft.
Storage temperature: −40°C to +75°C.
Storage altitude: ≤ 50,000 ft.
Power: 100/120/220/240 V, +5%, −10%, 48 to 66 Hz; 90 VA, 120 VA with all options; 10 VA standby.
Weight: 9 kg (20 lb) net; 14.5 kg (32 lb) shipping.
Size: 132.6 H x 425.5 W x 497.8 mm D (5.25″ x 16.75 ″ x 19.63″).

Ordering Information*

	Price
HP 3325A Frequency Synthesizer	$4,500
Opt. 001 High Stability Frequency Reference	add $750
Opt. 002 High Voltage Output	add $250
Opt 907 Front Handle Kit (standalone orders P/N HP 5061-0089)	$55 ☎
Opt 908 Rack Flange Kit (standalone orders P/N HP 5061-0077)	$32.50 ☎
Opt 909 Rack Flange and Handle Combination Kit (standalone orders P/N HP 5061-0083)	$80 ☎

*HP-IB cable not supplied. See page 133.
☎ Fast-Ship product—see page 133.

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